The design and application of English pronunciation training software based on Android intelligent mobile phone platform

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Abstract

In order to solve the problem of low efficiency and interactive in in English language pronunciation training, the Android intelligent mobile phone platform is designed and applied in this paper. English is the most widely used language in the world, and has become more and more popular in our country. In the process of learning English as the second language, our native language now plays an irresistible role. One kind is positive transfer and the other is negative transfer. In allusion to the question that pronunciation rating is inaccurate and lack of effective feedback when speech recognition technology is applied to verbal learning, the research puts forward an assisted learning system based on the method of AP rating and the technology of pronunciation resonance peak contrast. Then, according to the characteristics of the Android platform the research provides a feasible technical scheme for the development of oral English training system. Finally, by programming in Java language for the relevant algorithm and software interface in Eclipse integrated environment, the system is realized in the ZTE V880Android OS2.2mobile platform. This paper introduces specific technical realization of each module, and provides implementation details and codes for some core modules.

Keywords: Design and Application, English Pronunciation, Training Software, Android Intelligent Mobile Phone Platform.

1. INTRODUCTION

English has become an international language or lingua franca, which is no longer owned just by its native speakers, and its non-native speakers outnumbered its native speakers. As one of the central concepts in world English, intelligibility is of paramount importance in intercultural communication. The concept of intelligibility was first put forward by Cartford in 1950, who distinguished intelligibility from the effectiveness of an utterance. Smith and Nelson (Qian et al., 2008) defined intelligibility as the understanding of the speakers’ intention, and divided it into three layers, namely, intelligibility, comprehensibility and interpretability. In their view, intelligibility was defined as word and utterance recognition; comprehensibility as utterance meaning and interpretability as the perception and understanding of the speakers’ intentions (Yan et al., 2013). Smith (Wahlster et al., 2010) viewed these categories as degrees of understanding on a continuum. In the current study, Intelligibility was operationalized into the categories of intelligibility and comprehensibility.

Many scholars have conducted research on the intelligibility of different varieties of English, such as American English, Indian English, Japanese English, Nigerian English, South-east English and Singapore English and so on; however, the intelligibility of Chinese-accented English is a less studied area, except for some findings on the intelligibility of Hong Kong English (Wang and Zhang, 2013; Rukzio, 2005). Domestic Chinese-accented English study focused on the negative transfer by Chinese. Moreover, the relevant studies were sporadic since their focuses were only on specific dialect transfer instead of the systematic study on common features of Chinese-accented English. In terms of research methodology, few empirical studies were seen in literature. Furthermore, the research subjects were English major students or middle school students instead of non-English major students, who constituted the majority of the university students. The current research aims to identify the features that hamper international intelligibility of Chinese-accented English, and suggest priorities for English pronunciation teaching in the context of China.
In recent years, as more and more Chinese people are learning English, many kinds of English learning software’s appear, but most of them are lack of effective evaluation and feedback for pronunciation. However, in the learning of English pronunciation, effective feedback incentive is very important, especially for non-native speakers of English learners. This question has become a bottleneck in the development of intelligent English learning software. With the maturity of voice recognition technology, some people at home and abroad began to do the research on applying speech recognition technology to pronunciation learning, however, most of them stay in the theoretical level, only a small amount of mature application are large systems based on the computer platform, this provides a big development space for portable and intelligent pronunciation training system based on mobile platform. With the rapid development of mobile internet technology, the share of intelligent mobile phone is becoming larger. As an outstanding smartphone operating system, Android system developed rapidly in recent years, the share of the Android smartphone has reached up to 80%. Android smart phone not only has powerful data processing ability and flowery graphical user interface, but also has rich development components which make it quick and convenient to development applications. Compared to traditional computer software, the software on the Android smartphone is more convenient and practical. So developing a portable and popular English pronunciation learning system with pronunciation feedback function based on the Android platform has a strong meaning.

This paper is to develop a multi-function English pronunciation training system with the function of listening, repeating, and pronunciation assessment based on Android smartphone platform, so as to make the learning of English pronunciation popular and convenient. This paper contains the theoretical research and application development (Artail et al., 2010; Hu and Zeigler, 2013). First of all, the research studies the theory of speech recognition, and discusses voice ratings and pronunciation correction algorithm. In allusion to the question that pronunciation rating is inaccurate and lack of effective feedback when speech recognition technology is applied to verbal learning, the research puts forward an assisted learning system based on the method of AP rating and the technology of pronunciation resonance peak contrast. Then, according to the characteristics of the Android platform the research provides a feasible technical scheme for the development of oral English training system. Finally, by programming in Java language for the relevant algorithm and software interface in Eclipse integrated environment, the system is realized in the ZTE V880 Android OS2.2 mobile platform. This paper introduces specific technical realization of each module, and provides implementation details and codes for some core modules. This English pronunciation training system based on the Android smartphone platform has accomplished all the expected functions, includes the reading and repeating, real-time evaluation and pronunciation correction for English phonetic symbol and word pronunciation. According to the test, the pronunciation assessment of this system has high accuracy. For word and vowel pronunciation, the similitude degree between the system assessment and expert evaluation is above 90%, and the efficiency of pronunciation Correction reached to 80%, which means to a certain extent the system can improve the learners’ pronunciation.

Figure 1 shows an integrated English teaching network platform based on artificial intelligence

![Figure 1. The integrated English teaching network platform based on artificial intelligence](image)

2. MATERIALS AND METHODS

2.1 Overview
In recent years, people pay more attention to the importance of culture teaching in English language teaching. English language teaching and culture teaching are organic and interconnected components of English teaching, while an important aim of English teaching is to cultivate students' intercultural communication ability from a global perspective. For English learning, merely language teaching is not enough, nor is merely language learning, and successful English should cultivate students’ intercultural communication ability and integrate the social culture factors of a language into the language teaching for students. Successful English teaching is an important guarantee of successful intercultural communication, but in real life, there are many cases of communication misunderstanding and failure which are caused by the disconnection between language teaching and culture teaching. Therefore, it is necessary to enhance cultural infiltration in English teaching. Under the background of globalization, with the deeper intercourses of nations and ethnic groups, the cross-culture communication is becoming increasingly frequent. Language awareness, as the communicative corpus, which stores a large amount of knowledge and experience plays a significant role in cross-culture communication (Liu and Yao, 1997; Weiss et al., 2013; Zhu and Yang, 2013).

Language instruction is closely related to media. With the rapid development of multimedia technologies and network, multimedia, as an assistant means of teaching, finds a broad use in foreign language instruction. According to College English Curriculum Requirements drawn up by Ministry of Education of the People’s Republic of China, network-based multimedia instruction will be a new approach to college English instruction, and at the same time it will be the development orientation of the reform of English teaching and learning in colleges and universities. In this paper, through teaching practice with the aid of multimedia and by making an attempt at a new teaching model based on the multimedia and Internet technology, the author makes a comparison between two different multimedia teaching models to testify whether the new model (the combination of classroom lectures and network-aided autonomous learning) is superior to the old one (classroom lectures and listening and speaking practice in the language lab) in respect of promoting students’ English abilities, so as to find out an effective multimedia teaching model conforming to the author’s own institute in order to promote the abilities of FLTL (foreign language teaching and learning). Meanwhile the author points out the limitations of the experiment and the reflection on the application of the network multimedia instruction to prepare the ground for further practice of college English teaching based on multimedia and Internet technology.

The paper starts with a brief introduction of the definition of “multimedia” and its function in foreign language instruction; it points out the adoption of the new teaching model built on Internet technology conforms to College English Curriculum Requirements (Colvin, 2014). Propelled by the reform tide and backup of constructivist learning theory, the author makes an attempt to apply the new model with the combination of classroom lectures and network-aided autonomous learning into the practical teaching. This paper gives a brief introduction to the history of “multimedia” and its application and study in language teaching and learning. It makes a literature review of the development of media from traditional media like blackboard, pictures and objects to modern media like radio, slide projector, telephone, television, film and video, and later to new technological multimedia such as computer, video projector and network, etc. In the course of these changes, multimedia instruction is transformed from traditional concept to CAI (computer assisted instruction) based on multimedia technology.

In the context of globalization, people of different cultural backgrounds must meet the following conditions before they have effective communication with each other. Besides having a good command of foreign languages, they need to understand foreign culture, experience and know the differences between the native culture and the foreign culture possess enough linguistic competence and intercultural communicative competence (Maienborn, 2001).

China has gone through a series of foreign language teaching reforms, but constantly with very disappointing results: the students have very strong linguistic competence and practical skills, but lack social cultural competence and intercultural competence. College English teaching is a typical example. Through deep and intensive research work, we discovered seven main causes of the problem.

1. The mainstream approaches and methods of foreign language teaching all neglected the important role of cultures in foreign language teaching and communication.

2. The foreign language teaching circle lacks a mature intercultural language teaching model, especially an intercultural college English teaching model.
3. Most schools want a college English syllabus that contains necessary items of intercultural communication.

4. Teachers and students of English language are deficient in awareness of intercultural communication.

5. Teachers are in want of culture teaching training and of chances to get exposed to English and American cultures.

6. Textbooks of intercultural communication in English are rare.

7. Systematic evaluation methods and standards for cultural competence are lacking at schools.

Language teaching that aims to turn out foreign language masters has a history of over 100 years. Its evolution consists of four main stages.

1. Teaching grammar and trying to foster students’ reading ability.

2. Emphasizing imitation and repetition in the light of children’s acquisition of their native language to improve the students’ listening and speaking skills.

3. With cognition as precondition, trying to develop students’ ability to use English in an all-round way or to develop their communicative competence.

4. With language and culture as input, trying to cultivate students’ social cultural competence and intercultural communicative competence. Up to now there are no less than twenty systemized approaches and methods in language teaching, five of which are most influential. They are Grammar-translation Method, Direct Method, Audio-lingual Approach, Cognitive Approach and Communicative Approach. The first four methods and approaches all aimed to teach language knowledge and to improve language skills and all made great contributions to language education, but all neglected cultural factors.

2.2 The system model and algorithm

With the technology advancement of smart phone, developing educational application on Android OS takes great advantage of augmented reality technology which can make the application more portable, practical and interactive.

With the widely usage of 3G and 4G communication technology and the mass manufacture of many kinds of cell phone manufacturers in last five years, smart phones are widespread. Leading in the market share, android operating system is used intensively in smart phones and tablet android with the advantage over open platform, good hardware compatibility the convenient of development and Google play, which has millions of apps. Android operating system has been used in billions of mobile devices. In the time of android system being used widely, android widget which is small in homepage, convenient and easy to use is quite popular. There are some popular android widget, such as search widget, calendar, music and weather. Android widget is based on broadcast which is one of the six main components in android and app widget framework. It can not only show important content in homepage, but also update information immediately, for example, the note which can record Upcoming Events and weather widget which can show the weather timely. As a consequence, android widget which is frequently used as its convenience is an essential part of android system. By studying and applying the framework of android, UML, android components, SQLite database, data storing and acquiring and the methods to develop android widget, this thesis design and implement four android widgets, such as search, note, calendar and weather. Figure 2 shows the framework for Android structure.
Although the specific approaches have varied widely, the data management approaches to sensor networks have broadly followed similar themes. Among the three popular techniques described above, both Cougar and Tiny DB use a database approach towards sensor data management while Direct Diffusion falls into the other category. Unfortunately, there is no further research focus on sensor network data mining had been conducted as of today. The network topology is shown in figure 3.

The basic equation of the algorithm is shown in the following equation (1):

\[
\hat{f}_h^\alpha(x) = \frac{1}{\Gamma(1+\alpha)} \int_{-\infty}^{\infty} f(t) (t-x)^\alpha (dt)^\alpha \\
= \frac{1}{\Gamma(1+\alpha)} \int_{-\infty}^{\infty} f(t) g(x-t)(dt)^\alpha \\
= f(x) * g(x),
\]

The equation is as follows:

\[
\partial_j (\theta_{ijkl} \partial_x u_i + e_{ijkl} \partial_x \phi) - \rho u_i = 0
\]

Under the linear theory, that is:

\[
\partial_j (\epsilon_{ijkl} \partial_x u_i - \eta_{ijkl} \partial_x \phi) = 0
\]

The linear equation can be expressed into the following simplified forms:

\[
L(\nabla, \omega) f(x, \omega) = 0
\]
\[ L(\nabla, \omega) = T(\nabla) + \omega^2 \rho J \]  

(4)

In which,

\[ T(\nabla) = \begin{bmatrix} T_{ik}(\nabla) & T_{li}(\nabla) \\ T_{kj}(\nabla) & -\tau(\nabla) \end{bmatrix}, \quad J = \begin{bmatrix} \delta_{ik} & 0 \\ 0 & 0 \end{bmatrix}, \quad f(x, \omega) = \begin{bmatrix} u_k(x, \omega) \\ \phi(x, \omega) \end{bmatrix} \]  

(5)

Consider delay, the L can be expressed as:

\[ L^0 = \begin{bmatrix} C^{0}_{ik} & e^{0}_{kj} \\ e^{0}_{kl} & -\eta^{0}_{ik} \end{bmatrix} \]  

(6)

These functions can be expressed in the following form:

\[ C(x) = C^0 + C^1(x), \quad e(x) = e^0 + e^1(x), \quad \eta(x) = \eta^0 + \eta^1(x), \quad \rho(x) = \rho_0 + \rho_1(x) \]  

(7)

The value with superscript of 1 represents the difference below:

\[ C^1 = C - C^0, \quad e^1 = e - e^0, \quad \eta^1 = \eta - \eta^0, \quad \rho_1 = \rho - \rho_0 \]  

(8)

And local fractional integral of \( f(x) \) defined by Eq. (9).

\[ a f^{(\alpha)}_b(t) = \frac{1}{\Gamma(1+\alpha)} \int^b_a f(t)(dt)^\alpha = \frac{1}{\Gamma(1+\alpha)} \lim_{\Delta \to 0} \sum_{j=0}^{N-1} f(t_j)(\Delta t_j)^\alpha \]  

(9)

Its local fractional Hilbert transform, denoted by \( f^H_x(\alpha)(x) \) is defined by

\[ H_{\alpha} \{ f(t) \} = f^H_x(\alpha)(x) = \frac{1}{\Gamma(1+\alpha)} \int^\infty_{-\infty} \frac{f(t)}{(t-x)^\alpha}(dt)^\alpha \]  

(10)

Where \( x \) is real and the integral is treated as a Cauchy principal value, that is,

\[ \frac{1}{\Gamma(1+\alpha)} \int^\infty_{-\infty} \frac{f(t)}{(t-x)^\alpha}(dt)^\alpha = \lim_{\varepsilon \to 0} \left[ \frac{1}{\Gamma(1+\alpha)} \int^\infty_{-\infty} \frac{f(t)}{(t-x)^\alpha}(dt)^\alpha + \frac{1}{\Gamma(1+\alpha)} \int^\varepsilon_{-\varepsilon} \frac{f(t)}{(t-x)^\alpha}(dt)^\alpha \right] \]  

(11)

To obtain the inverse local fractional Hilbert transform, write again Eq. (11) as
\[ \hat{f}_H^\alpha (x) = \frac{1}{\Gamma(1+\alpha)} \int_{-\infty}^{\infty} f(t) \left( \frac{1}{(t-x)^\alpha} \right) (dt)^\alpha \]

\[ = \frac{1}{\Gamma(1+\alpha)} \int_{-\infty}^{\infty} f(t) g(x-t)(dt)^\alpha = f(x) * g(x), \] (12)

The equation of motion is as follows:

\[ \partial_j \left( C_{ijkl} \partial_k u_i + e_{ijkl} \partial_k \phi \right) - \rho \ddot{u}_i = 0 \] (13)

Under the linear theory, that is:

\[ \partial_j \left( e_{ijkl} \partial_k u_i - \eta_{ijkl} \partial_k \phi \right) = 0 \] (14)

Since the emerging of AI (short for artificial intelligence) in Dartmouth Conference in June 1956, it has got rapid development. Since more than 50 years of emerging, as an emerging interdisciplinary subject, AI has got rapid development at the same time that the ideas, theories, methods and technologies of AI has penetrated into many areas of science and technology and various aspects of human life. AI is the behavior that makes intention to use computer intelligence to simulate human intelligence, and uses this to deepen the awareness and understanding on the essence of function and intelligent of human brain. Though the artificial intelligence technology rise from the mid-1950s to the present has nearly 60 years of history, its research and application field is very broad. It has developed very rapidly and formed a far-reaching impact. Such as the Expert System, Pattern Recognition, Robotics and so on has had a profound impact on human economic, cultural, ecological and other aspects of human life. But like any other new technology, artificial intelligence technology brings benefits to mankind also brings many ethical problems.

3. RESULTS AND DISCUSSION

With the rapid development of 3G wireless technologies and the expanding coverage of 4G networks, the explosive growth of mobile data services has arisen. On one hand, the growth of data services will bring more revenue and opportunities to the operators. On the other hand, the growth will make it more difficult for the operators to configure and optimize the networks. Therefore, it is of great significance for wireless network planning and optimization to collect, analyze and predict the mobile Internet traffic. As all kinds of wireless technologies emerge, users get more and more frequent access to the Internet via handheld devices, especially those using Android, an open source operating system with a very high market share. A wide variety of Android devices have covered all customer groups, which makes Android a typical system to study.

The platform consists of a terminal-side data collection system based on Android and a server-side data analysis system. Firstly, the overall and module design of the terminal-side data collection subsystem is described in detail. The terminal-side system can collect various types of service data of cellular subscribers, such as voice service data, short message service data and traffic data. The GPS coordinates and cellular signal strength when the traffic is generated is also recorded. Then, the overall and module design of the server-side data analysis subsystem is presented. Due to the large amount of traffic data caused by the increasing number of users and the long-lasting data collection process, a single server may not accomplish the computing tasks. To deal with this problem, a big data processing module based on Hadoop is designed for the server-side system. At last, the prediction of wireless network traffic based on SVR model is performed by using real traffic data collected by the platform. It is shown that the precision of SVR-based prediction is close to 90% in different time scales. At last, the prediction of wireless network traffic based on SVR model is performed by using real traffic data collected by the platform. The precision of the SVR-based prediction results is close to 90% in different time scales, which proves SVR an effective method to predict wireless network traffic. The platform we design in this thesis can provide an integrated solution for cellular service data collection, analysis and prediction. It also works well with big data.

Before the experiment, I give the following hypotheses: 1) The new model has no distinctions with the former one in improving students’ English abilities. 2) The new model is more effective than the former one, especially in improving the students’ listening and speaking ability. 3) The new model has no effectiveness than the old one,
as the students have been accustomed to the old model, or they are at a loss in autonomous learning. To ensure the reliability of the experiment, I have sampled two of my own classes as the subjects of the experiment, and the other two regular classes as my control groups. They are sophomores and have been taught college English by me for a year. There is no significant variability in their English abilities between each comparing group according to their average scores of the college entrance examination and the mid-term and the final-term examinations during their first academic year. Students of each contrasting group are from the same department with the same major and the same number. There are 9 levels of the selected universities, and the result of the sub-items was as followed Table 1.

Table 1 The experiment result

<table>
<thead>
<tr>
<th>Type of the university</th>
<th>No. of the sub-items</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>1st level</td>
<td>0.94</td>
</tr>
<tr>
<td>2nd level</td>
<td>0.84</td>
</tr>
<tr>
<td>3rd level</td>
<td>0.86</td>
</tr>
<tr>
<td>4th level</td>
<td>0.81</td>
</tr>
<tr>
<td>5th level</td>
<td>0.78</td>
</tr>
<tr>
<td>6th level</td>
<td>0.76</td>
</tr>
<tr>
<td>7th level</td>
<td>0.71</td>
</tr>
<tr>
<td>8th level</td>
<td>0.65</td>
</tr>
<tr>
<td>9th level</td>
<td>0.57</td>
</tr>
</tbody>
</table>

The result shows more than eighty percent of students are interested in it. All these subjective and objective factors make it possible for me to attempt the teaching model---college English teaching model in the setting of multimedia and Android technology. The contents of the experiment include the comparison of the two different multimedia teaching models by means of their effectiveness in listening, speaking and writing skills. Figure 4 and figure 5 shows the design result of English pronunciation training software based on Android intelligent mobile phone platform.

Figure 4. The design result of English pronunciation training software based on Android intelligent mobile phone platform
4. CONCLUSION

The Android intelligent mobile phone platform is designed and applied in this paper to solve the problem of low efficiency and interactive in in English language pronunciation training. English is the most widely used language in the world, and has become more and more popular in our country. In this paper, the author makes a comparison between two different multimedia teaching models to testify whether the new model (the combination of classroom lectures and network-aided autonomous learning) is superior to the old one (classroom lectures and listening and speaking practice in the language lab) in respect of promoting students’ English abilities, so as to find out an effective multimedia teaching model conforming to the author’s own institute in order to promote the abilities of FLTL (foreign language teaching and learning). Multimedia can enhance the multi-dimension of transmitting information. In the process of learning English as the second language, our native language now plays an irresistible role. Through the disposal of the teaching content by way of sound and animation, the integration of sound and image, and careful design of screen background and typeface, teaching information is able to be transmitted in three dimensions as sound, picture, and text. As a result, students will be active to accept the information. It is undoubtedly an effective way for language instruction.

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